

Linear Equations, Inequalities and Systems: math test solutions, Grade 11 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Lines and slope

/ 3 pts

(a) $m = \frac{-1 - 5}{4 - (-2)} = \frac{-6}{6} = -1$. (1 pt)

(b) $y - 5 = -(x + 2)$, so $y = -x + 3$. Check with B : $-4 + 3 = -1$. (1 pt)

(c) Same slope -1 and y-intercept -4 : $y = -x - 4$. (1 pt)

2 Absolute value

/ 3 pts

(a) $2x - 5 = 11$ gives $x = 8$; $2x - 5 = -11$ gives $x = -3$. Solutions: 8 and -3 . (1 pt)

(b) $x + 1 \geq 5$ or $x + 1 \leq -5$, so $x \geq 4$ or $x \leq -6$. In interval notation, $(-\infty, -6] \cup [4, \infty)$. (2 pts)

3 Compound inequalities

/ 3 pts

- (a) Subtract 3: $-12 \leq 2x < 4$. Divide by 2: $-6 \leq x < 2$, that is $[-6, 2)$. (2 pts)
- (b) $4x < 4$ gives $x < 1$; $2x \geq 10$ gives $x \geq 5$. The solution is $(-\infty, 1) \cup [5, \infty)$. (1 pt)

4 Concert tickets

/ 3 pts

- (a) $s + a = 220$ and $9s + 14a = 2380$. (1 pt)
- (b) Substitute $s = 220 - a$: $1980 - 9a + 14a = 2380$, so $5a = 400$ and $a = 80$, $s = 140$. (1 pt) Check: $9(140) + 14(80) = 1260 + 1120 = 2380$. (0.5 pt) The concert sold 140 student tickets and 80 adult tickets. (0.5 pt)

5 A system of three equations

/ 3 pts

Add the first two equations: $2x + 3z = 18$. (1 pt)

Subtract the third equation from the first: $-x + 2z = 5$, so $x = 2z - 5$. Substitute:

$4z - 10 + 3z = 18$, so $z = 4$ and $x = 3$. (1 pt)

From the first equation, $y = 9 - 3 - 4 = 2$. Check in the second: $3 - 2 + 8 = 9$; in the third: $6 + 2 - 4 = 4$. The solution is $(3, 2, 4)$. (1 pt)

6 Linear programming

/ 3 pts

The vertices are $(0, 0)$, $(10, 0)$, $(0, 6)$, and the intersection of the two lines: subtracting the equations gives $2y = 8$, so $y = 4$ and $x = 6$: $(6, 4)$. (2 pts)

$P(0, 0) = 0$, $P(10, 0) = 40$, $P(0, 6) = 30$, $P(6, 4) = 24 + 20 = 44$. The maximum is 44, reached at $(6, 4)$. (1 pt)

7 Matrices

/ 2 pts

(a) $\det A = 4 \cdot 1 - 3 \cdot 1 = 1$, so $A^{-1} = \begin{bmatrix} 1 & -3 \\ -1 & 4 \end{bmatrix}$. (1 pt)

(b) $X = A^{-1}B = \begin{bmatrix} 17 - 15 \\ -17 + 20 \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$. Check: $8 + 9 = 17$ and $2 + 3 = 5$. So $x = 2, y = 3$. (1 pt)



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